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THIRD ANNUAL MEETING OF THE MATHEMATICAL ASSOCIATION OF AMERICA.

The third annual meeting of the Association was held at the University of Chicago on Thursday and Friday, December 27–28, 1917, in conjunction with the Chicago Section of the American Mathematical Society, which met on Friday and Saturday of that week. There were 119 in attendance at the various sessions, including the following 93 members of the Association and one institutional delegate:

L. D. AMES, University of Missouri.
R. C. ARCHIBALD, Brown University.

I. A. BARNETT, Chicago, Ill.
MRS. W. E. BECKWITH, College for Women, Western Reserve University.
G. A. BLISS, University of Chicago.
P. P. BOYD, University of Kentucky.
H. T. BURGESS, University of Wisconsin.
W. H. BUSSEY, University of Minnesota.

W. D. CAIRNS, Oberlin College.
FLORIAN CAJORI, Colorado College.
D. F. CAMPBELL, Armour Institute of Technology.
R. D. CARMICHAEL, University of Illinois.
W. E. CEDERBERG, Augustana College.
H. E. COBB, Lewis Institute.
L. M. COFFIN, Coe College.
C. E. COMSTOCK, Bradley Polytechnic Institute.
M. W. COULTRAP, North Western College.
A. R. CRATHORNE, University of Illinois.
G. H. CRESSE, University of Michigan.
D. R. CURTISS, Northwestern University.

ALFRED DAVIS, Parker High School, Chicago.
E. W. DAVIS, University of Nebraska.
L. E. DICKSON, University of Chicago.
E. L. DODD, University of Texas.
ARNOLD DRESDEN, University of Wisconsin.
OTTO DUNKEL, Washington University.

ARNOLD EMCH, University of Illinois.
L. C. EMMONS, Michigan Agricultural College.
H. T. ETTLINGER, University of Texas.

J. A. FOBERG, Crane Junior College, Chicago.
W. B. FORD, University of Michigan.
A. F. FRUMVELLER, Marquette University.

CORNELIUS GOUWENS, University of Iowa.
M. E. GRABER, Heidelberg University.

LAURENCE HADLEY, Earlham College.
W. A. HAMILTON, Beloit College.
HARRIS HANCOCK, University of Cincinnati.
J. O. HASSLER, Crane Junior College, Chicago.
E. R. HEDRICK, University of Missouri.
T. H. HILDEBRANDT, University of Michigan.
F. H. HODGE, Franklin College.
E. V. HUNTINGTON, Harvard University.

Nelle L. Ingels, Greenville College.

Jessie M. Jacobs, Urbana, Ill.

A. M. Kenyon, Purdue University.
J. M. Kinney, Hyde Park High School, Chicago.
H. R. Kingston, University of Manitoba.
Daniel Kreth, Wellman, Ia.

Kurt Laves, University of Chicago.
D. A. Lehman, Goshen College.
Flora Le Stourgeon, Leggett School, Detroit.
E. B. Lytle, University of Illinois.

W. D. MacMillan, University of Chicago.
Malcolm McNeill, Lake Forest College.
W. O. Mendenhall, Earlham College.
G. A. Miller, University of Illinois.
G. R. Mirick, New Castle (Pa.) High School.
U. G. Mitchell, University of Kansas.
C. N. Moore, University of Cincinnati.
E. H. Moore, University of Chicago.
C. C. Morris, Ohio State University.
E. J. Moulton, Northwestern University.
G. W. Myers, University of Chicago.

M. J. Newell, Evanston (Ill.) High School.

H. L. Olson, Chicago, Ill.

C. I. Palmer, Lewis Institute.
H. B. Phillips, Mass. Institute of Technology.
L. C. Plant, Michigan Agricultural College.

Jessie G. Quigley, College of Saint Teresa.

O. J. Ramler, Catholic University of America.
W. R. Ransom, Tufts College.
S. E. Rasor, Ohio State University.
H. L. Rietz, University of Illinois.
W. H. Roever, Washington University.

Ida M. Schottenfels, Chicago.
G. H. Scott, Benzonia Academy.
J. B. Shaw, University of Illinois.
L. S. Shively, Mount Morris College.
C. H. Sisam, University of Illinois.
H. E. Slaught, University of Chicago.
A. W. Smith, Colgate University.
G. W. Smith, Beloit College.
C. C. Spooner, Northern Michigan State Normal School.

E. H. Taylor, Eastern Illinois Normal School.
E. J. Townsend, University of Illinois.
H. W. Tyler, Mass. Institute of Technology.

J. N. Van der Vries, University of Kansas.

L. G. Weld, Pullman (Ill.) Manual Training School.
A. E. Whitford, Milton College.
J. A. Whitted, Hedding College.
E. J. Wilczynski, University of Chicago.

J. W. A. Young, University of Chicago.

John Zimmerman, Dubuque German College.

Cliff Guild, Illinois Wesleyan University (institutional delegate).

Some were doubtless kept from the meetings because of the inconveniences of railway travel and because of considerations of economy based on patriotic grounds;* yet it is worthy of note that so large a number showed by their presence and participation their conviction that the torch of learning must be kept bright in this as well as in other ways in the present troublous times. Twelve came from institutions more than five hundred miles from Chicago, including four from Massachusetts, three from Texas, one each from Colorado, Washington, D. C., Manitoba, New York and Rhode Island.

As announced in the program the opening session on Thursday morning was devoted to papers presented by members on their own initiative. It has been recognized from the outset that the Association programs must not merely include papers and discussions on topics selected by a committee from among the most important subjects in collegiate mathematics, but that there shall also be afforded an open forum for the presentation of papers not thus limited. The latter might well include reports on special methods of problem solutions, pedagogical discussions, accounts of original investigations, the organization of a particular topic or chapter in some collegiate subject, etc. That such a combined program has elements of strength greater than one composed either entirely of selected papers on specified topics or papers entirely unrestricted, seems unquestionably answered in the affirmative by the result at Chicago. In anticipation of similar programs at future meetings, the officers of the Association earnestly urge this opportunity upon the attention of our members, so that when a call comes for either type of papers, there may be a ready and hearty response. The "Questions and Discussions" in recent numbers of the MONTHLY indicate that our members appreciate an open forum, and it seems evident that a fuller opportunity should be provided than the crowded pages of the MONTHLY allow.

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* See letter by Professor T. W. Richards, in *Science*, Dec. 28, 1917.

On Thursday evening the joint dinner of the Society and the Association was held at the Quadrangle Club with an attendance of 73. The toastmaster, President Cajori, called upon the following members, who responded with brief remarks: Professor E. H. Moore, University of Chicago; Professor W. B. Ford, University of Michigan; Professor E. V. Huntington, Harvard University; Professor L. E. Dickson, University of Chicago; Professor E. L. Dodd, University of Texas; and Professor E. R. Hedrick, University of Missouri. Much interest was expressed in various phases of war activity and in the share which the Association's members have in the country's service. By request, the secretary of the Chicago Section of the Society and the secretary of the Association collated rather hastily and read a list of 48 American mathematicians known to be in national service at present. About forty members took advantage of the invitation of the American Association of University Professors to attend the dinner on Friday evening at the Quadrangle Club. As in the case of earlier meetings, so at Chicago admirable accommodations and plans made by the local members of the Committee on Arrangements helped greatly to further social intercourse and to render everyone's enjoyment the more complete. The members of this Committee and those of the Program Committee merit much praise for the thoughtful planning which made the meetings a success.

President Cajori presided except on Thursday afternoon, when he called Professor E. W. Davis to the chair. Professor L. E. Dickson, president of the American Mathematical Society, presided at the joint session on Friday afternoon. At this session Professor W. B. Ford gave his retiring address as chairman of the Chicago Section of the Society, on the subject "A conspectus of the modern theory of divergent series." On behalf of the Association, Professor L. D. Ames of the University of Missouri gave an address "On a definition of the real number system by means of infinite decimals." Professor Ford's paper has been offered to the *Bulletin* of the Society for publication. The following is an abstract of Professor Ames's paper:

The purpose of this paper was to present a definition of the real number system which, while sound logically, shall be pedagogically simpler than the well-known methods. Pedagogically the number system is built up by successive steps; with one exception each step follows rather closely our intuitive notions; but in the definition of irrational numbers all the commonly accepted methods of approach break rather sharply with our intuitions and are rather complicated. The mode of procedure suggested in this paper is as follows: It is first shown that all rational numbers can be expressed as terminating or repeating decimals, and that conversely all terminating or repeating decimals are rational. Then examples of individual infinite decimals which do not repeat are given; these are not rational, but they make as vivid an appeal to the student as do the rationals. A real number is then defined as an expression in the decimal notation, this being justified pedagogically and logically. A logical treatment of the properties of real numbers follows closely the natural suggestions of the decimal notation. The notion of a continuum is approached as follows: The rational number system has certain properties of order which are carefully stated. The student knows some infinite decimals which are not rational; these can be inserted one at a time between rationals, and the enlarged system will have at each stage the properties just mentioned. To speak crudely, there seem to be vacant spaces where new individual numbers can be inserted between those already given. On the other hand it is not possible to insert in the set of all infinite decimals a single new element so that the enlarged set shall have the properties stated. To speak crudely again, all the vacant spaces seem to be filled. This idea is the basis of the definition given of a continuum.

The other parts of the program are grouped under three leading heads, and abstracts are given corresponding to the numbers in each list, together with reports of some further informal discussions.

CONTRIBUTED PAPERS.

(1) "The Graph of $f(x)$ in Line-Coördinates for Complex Numbers." PROFESSOR A. F. FRUMVELLER, Marquette University.

(2) "Note on the Generalization of the Witch and the Cissoid." PROFESSOR F. H. HODGE, Franklin College.

(3) "Fermat's Method of Infinite Descent." PROFESSOR W. H. BUSSEY, University of Minnesota.

(4) "On the Disciplinary and Applied Values of Mathematical Study." PROFESSOR C. N. MOORE, University of Cincinnati.

(5) "On the Content of a Second Course in Calculus." PROFESSOR E. J. MOULTON, Northwestern University.

(6) "Comments on Mathematics in the High School." PROFESSOR HARRIS HANCOCK, University of Cincinnati.

(1) The graph of $f(x)$ in ordinary point-coördinates leads to a 3-dimensional diagram when x or y is taken as complex; and to a 4-dimensional diagram when both are complex. Professor Frumveller's paper was described as an attempt to escape from this difficulty by employing line-coördinates. A base-line

OO_1 and two lines, OX, OY, perpendicular to it and in one plane, are the framework used. The "locus" of the moving line is that part of the plane over which the line is free to range. Lacunary regions exist, bounded by the "envelope" of the line.

When x, or y, or both, become complex, the lines OX, OY are replaced by planes. The moving line now ranges over a 3-space, and generates ruled surfaces, the lacunary regions being now bounded by the curves called respectively the "edge of regression," and the "line of striction." A method of handling this diagram conveniently was indicated.

(2) In this note Professor Hodge presented two simple constructions, each leading to a family of quartic curves involving a parameter k. As k becomes infinite the first construction merges into the classic construction for the witch and the equation becomes the equation of the witch. Under the same conditions the second construction becomes the construction for the cissoid and its equation becomes the equation of the cissoid.

(3) Professor Bussey's introduction to Fermat's famous method of infinite descent and discussion of its range of usefulness will appear in full in a forthcoming issue of the MONTHLY.

(4) In this paper the disciplinary value of mathematical study as a training in reasoning was exhibited by Professor Moore in the following fashion: Certain well-known examples of deductive reasoning in the fields of public debate and natural science are analyzed into their logical elements. Parallel with each example are given one or more examples of deductive reasoning in elementary algebra and geometry, which are built up from precisely the same logical elements. Thus the medium for the transfer of training is shown in explicit form. The applied value of mathematical study is shown by pointing out that a knowledge of elementary mathematics is essential for a proper understanding of the scientific discussion of almost any subject that can be studied scientifically. Thus, for example, some knowledge of mathematical notation and procedure is necessary, not only in all the natural sciences, but also in psychology and the social sciences.

(5) In his discussion Professor Moulton commented on the obvious general need of a second course in calculus, and on the diversity of ways in which the need is met. One source of difficulty in outlining a course for general consideration lies in the differences in the preparation of students in various institutions due mainly to the different lengths of the first course in calculus. An outline was presented of a course to follow a first course of about a hundred lectures. It is the hope of the editors that a fuller account of this paper may be given in an early number of the MONTHLY.

(6) Professor Hancock said that the arguments given in recent years by various non-mathematicians in support of the classics and English apply with equal force to mathematics. Noteworthy are a book on "The value of the

classics" by Dean Andrew F. West of Princeton University, a speech by Dean Roscoe Pound of Harvard Law School, the speech by Ex-President Grover Cleveland at the inauguration of Woodrow Wilson as president of Princeton University, and the answering comments of President Wilson. Professor Hancock urged also the desirability of having an experimental high school which shall be entirely antipodal to the Flexner "Modern School," and reported on various investigations of the past few years, chiefly of one in Cincinnati in which business men and a general group of college and university teachers voted predominatingly for a rigorous course which should include mathematics.

SESSION ON DESCRIPTIVE GEOMETRY.

(1) Address: "Descriptive Geometry and its Merits as a Collegiate as well as an Engineering Subject." PROFESSOR W. H. ROEVER, Washington University.
Discussions by
(2) PROFESSOR F. HIGBEE, Department of Descriptive Geometry and Drawing, State University of Iowa.
(3) PROFESSOR A. V. MILLAR, Department of Drawing, University of Wisconsin.
(4) PROFESSOR ARNOLD EMCH, Department of Mathematics, University of Illinois.
(5) MR. WILLARD W. ERMELING, Instructor in Descriptive Geometry, Crane Junior College, Chicago.
(6) MR. W. F. WILLARD, Instructor in Drawing, Carl Schurz High School, Chicago.
General Discussion.

(1) In his address Professor Roever traced the development from the early attempts to solve the problems encountered in building and stone-cutting to the descriptive geometry of Monge, and showed how the needs of the artist were responsible for perspective, which in turn brought forth projective geometry, axonometry and photogrammetry and thus completed the work begun by Monge. He emphasized the two purposes: (1) to represent, by figures which lie in a plane, the objects of space; (2) to solve, by geometric constructions which can be executed in a plane, the problems of space; and then showed that the Mongean method fulfills best the second purpose and perspective the first, but that the axonometric method of making parallel projections satisfies simultaneously both. He called attention to the fact that the development of descriptive geometry in Europe has been confined almost exclusively to the technical schools and that in this country also it is confined to the engineering schools, being taught there to a limited extent only. He closed by saying that the hope for its development in this country depends on its introduction into the colleges and universities, that for this there is sufficient justification, that the requirements demanded of teachers of descriptive geometry should be raised and that mathematicians should familiarize themselves with it more fully.

Professor Roever's address will appear in full in an early number of the Monthly.

(2) "The study of descriptive geometry," writes August Comte, "possesses an important philosophical peculiarity, quite independent of its high industrial utility. This is the advantage which it so preëminently offers in habituating the mind to consider very complicated geometrical combinations in space, and to follow with precision their continual correspondence with the figures which are actually traced—of exercising to the utmost, in the most certain and precise manner, that important faculty of the human mind which is properly called imagination, and which consists, in its elementary and positive acceptation, in representing to ourselves, clearly and easily, a vast and variable collection of ideal objects, as if they were really before us. . . ." The more often one reads this statement and considers its true meaning, the more one becomes convinced that it contains the first and last word on the value of descriptive geometry as a college subject.

This "high industrial utility" of which Comte writes has quite generally been conceded. As evidence of this fact one might point out that from the beginning of technical schools down to the present descriptive geometry has held an important place in their courses of study, and has held it, one is tempted to add, in spite of the revolutions through which these same courses of study have passed with changing administrations and times. The relation which exists between descriptive geometry and designing is fundamental; it is the bedrock upon which may be based a knowledge of the art of drafting. As a fundamental part of the training of a designer, descriptive geometry should aim to accomplish three things: First, it should teach orthographic projection, and teach it most thoroughly. A designer must not only be able to make drawings but he must read them as well, and orthographic projection may truly be called the grammar of that language which is the means of communication between designers and builders. Secondly, descriptive geometry should develop the ability to solve graphically problems concerning the relations of points, lines and planes. These are, of course, but the elements in the representation of all engineering structures and it is essential that designers and draftsmen be trained to solve problems relating to them directly on the drawing-board. Thirdly, and perhaps most important of all, descriptive geometry should promote the ability to analyze a problem into its component parts, to reason logically and clearly from a given set of conditions to a required set of conclusions, to build up from a drawing a mental picture of what is there represented, or the reverse of this process; for without the ability to analyze, to reason, to visualize, and to translate from one language to another, a draftsman is lacking in the essential qualifications of his calling.

But since descriptive geometry has become established as an essential part of a technical course of study, perhaps we may assume its value in such a course and pass on to consider, without further comment here, whether or not the subject might with profit be seriously considered as deserving of a place in a non-technical college course. Let us turn again to our quotation from Comte. From this it must be evident that descriptive geometry, quite apart from its recognized practical value, is entitled to serious consideration for its educational advantages. If it has such advantages, then undoubtedly the subject deserves a place in a non-technical course of study.

Being a form of geometry, it should need no defense before an association such as this. If mathematics in any form possesses educational value, apart from the unquestioned usefulness of such subjects, then it should be agreed that descriptive geometry likewise has an educational value and is therefore deserving of recognition as a proper subject for study. But in addition to this perhaps recognized fact, it should be kept in mind that in descriptive geometry analysis and logical deduction are verified by graphical solution. Thus, not only does descriptive geometry possess all the merits of other forms of geometry but in addition it insists upon a mental attitude which leads one to visualize the problem, to see it in all its parts, and to work with conditions which are actually represented by a drawing. "A mathematical problem," to quote from another writer on the subject, "may usually be attacked by what is termed in military parlance the method of systematic approach; that is to say, its solution may be gradually felt for, even though successive steps leading to that solution cannot be clearly foreseen. But a descriptive geometry problem must be seen through and through before it can be attempted. The entire scope of its conditions, as well as each step toward its solution, must be grasped by the imagination. It must be taken by assault." Even to the sceptic it must be obvious that such a form of mental training is valuable; and when to this is added the usefulness of descriptive geometry as a real means of solving difficult problems with a considerable degree of precision, it should be granted that the subject might properly be placed in every college course.

(3) In descriptive geometry, objects of three dimensions are represented in outline on a plane sheet. This method of conveying an idea from one person to another by means of a drawing is widely used and is one of the most accurate and concise methods employed for that purpose. It is often superior to a written or oral description. The fundamental principles involved in making such a representation of an object are the principles included in descriptive geometry. The subject therefore has great practical importance and the principles are so universally employed that many times the user does not realize he is employing descriptive geometry. Those who have done much designing, either of buildings or of machines, and who have not made a formal study of descriptive geometry, use its principles; and if they take up the study of the subject later they find it very easy. For those who are preparing themselves to do design work, the study of the subject develops the reasoning and visualizing powers and enables them to progress more rapidly and intelligently with design.

The visualizing process, so often spoken of in connection with descriptive geometry, depends upon reasoning. The student reasons from the given conditions that the objects or magnitudes must be in a certain position in space and by his reasoning power builds up a mental picture, the clearness of which depends upon the clearness of his reasoning. The subject, therefore, in addition to its practical application, gives excellent training in reasoning—a particular kind of reasoning which results in a definite mental picture. Students who have had thorough training in mathematics, particularly calculus, find descriptive geometry much easier than those who have not had such training. The subject is peculiar in that the problems are usually seen as a whole. The student first analyzes the problem, which involves seeing it in complete form and as well the various fundamental steps which must be taken to reach the conclusion, and then he makes the construction which involves taking these steps in order until the conclusion is reached. There can be no better training given than by this process of grasping the problem as a whole and then testing the accuracy of the conclusion by an actual mechanical construction.

There are only a few fundamental principles in the subject, but these principles must be thoroughly learned if the student is to be master of the subject. He must know these principles as he knows the fundamental operations in arithmetic if he expects to solve successfully original problems. The fact that there are few fundamental principles and that these can be thoroughly mastered makes the subject just that much more valuable. With the laboratory practice which usually accompanies descriptive geometry comes the value of motor training and the emphasizing of principles studied in the class-room. This part of the subject should by no means be omitted and a fair degree of accuracy should be demanded. If the students in our colleges are to become proficient in the use of English, instructors in all subjects must help. Frequently a student must be told that he appears to understand the problem under discussion but that his statements are inaccurate and would be unintelligible to a person not familiar with the subject. He must repeat one or more times and may need the help of other students before the answer is satisfactory. There is no better subject in the college curriculum for emphasizing the need of clear and concise English than descriptive geometry.

The subject then is not merely of practical value but gives also excellent opportunity for training in reasoning, thoroughness, motor activity, and English.

(4) Professor Emch found himself in agreement with most of the views and arguments advanced by Professor Roever. A course in descriptive geometry, or constructive geometry, is certainly of great benefit to the student of mathematics. As in other branches of science, it is desirable that the student should first acquire a certain amount of geometric knowledge of forms and their representation before he is asked to argue about the logical foundations of science. This principle should be observed earlier in the teaching of geometry in the high school, *i. e.*, much more attention should be paid to the constructive side of geometrical instruction in its elementary stages. Much complaint about poor

results in many classes in geometry is probably due to this neglect. At the University of Illinois this want is met by a course in constructive geometry, which is open to students who have had analytic geometry. As a rule this course is very well attended; it serves as an introduction to projective geometry and other more advanced courses in geometry. It comprises chapters on the various possibilities of geometric construction, accuracy and simplicity of construction, inversion in the plane and in space (including stereographic projection), isometric projection, orthographic projection, perspective, the analytic form and mathematical principles of these projections, collineation, cross-ratio and its invariance in projection, elementary synthetic theory of conics and quadrics, description of curves by linkages.

It would seem that a course of this or a similar sort, as suggested by Professor Roever, should be taken by every prospective teacher of mathematics or writer of mathematical text-books along geometric lines. The great number of faulty drawings in many text-books on geometry would thereby be avoided. Moreover, no course can be made more inspiring for future geometrical research than constructive, or descriptive, geometry for beginners who intend to specialize in mathematics.

(5) Professor Roever's address suggests to Mr. Ermeling several questions to which attention may well be drawn. Perhaps the first that occurs is this: Should the subject of descriptive geometry be confined to technical schools? Prof. T. E. French of Ohio State University has said that descriptive geometry has three important functions: (1) to train the student to think in terms of three dimensions; (2) to visualize quickly and accurately; (3) to build up a clear mental image by a training in constructive imagination. These are of primary importance to the engineer, who deals with three-dimensional things. Are they any less important to the general student? Is not one of the needs of a course in mathematics this very training in visualization? We have all seen the pleasure of the students of analytical geometry in making graphs of their work. Are we doing our duty by the student of mathematics if we give him the symbols, the values, the equations and omit the other benefits so easily obtained by a course of mathematics worked out over the drawing-board? Is it not like trying to teach chemistry or physics without laboratory work?

It is undoubtedly true as Prof. V. T. Wilson says in the preface to his text-book, "that in the application of the principles of descriptive geometry to the making of working drawings, the necessary modifications have often caused the loss of sight of the fact that descriptive geometry is a mathematical subject." This raises the questions of (*a*) what should be the qualifications of the teacher of descriptive geometry, and (*b*) whether the subject should be taught by the department of drawing or by the department of mathematics. A little consideration would probably lead us to see that the teacher of the subject should have not only a mathematical training, but also a practical experience in the drafting room; or, to state it more broadly, not only engineering training but engineering experience. It does not then greatly matter whether the subject be considered a part of the drawing department or of the department of mathematics. The important thing is to have descriptive geometry related directly to the other branches of mathematics.

With all the foregoing facts in mind, it would seem that descriptive geometry has a value such that the subject could well be required in a general collegiate training in mathematics and not confined to the engineering courses as at present.

(6) In attempting to discuss the merits of Professor Roever's excellent paper, it might be well to answer first some of the questions which he submitted. (1) It is Mr. Willard's opinion that the preparation of a teacher of descriptive geometry should include an engineering education, inasmuch as the subject finds its greatest usefulness in that field. If a student majors in mathematics in a purely academic college course, he should likewise have a course in descriptive geometry. (2) It would seem from the meager data available that most of the smaller colleges present the subject in connection with the mathematics department, whereas, in the engineering schools, it is presented in conjunction with the drawing department. This is so because engineers emphasize the drawing phase for its practical application to many problems in industrial life. The colleges do not emphasize the drawing part of the subject perhaps because the department of engineering has not been established or developed, the student on that account giving the analytical part of the subject his exclusive attention. (3) The old texts, which have become fossilized, are in a measure responsible for a great deal of the distaste which students have for the subject. In the speaker's experience, where the subject was presented in the freshman year of an engineering course in college, many students were predisposed to failure, through the reputation of descriptive geometry which was passed on by those who had completed the course, a majority of these students having come from schools where not all the shops and drawing departments were yet established.

The advisability of extending this subject into the secondary schools rests largely with the school itself. It is obviously undesirable to require boys and girls alike to take descriptive geometry in a purely academic or college preparatory course in high school; but, where our city schools have included technical courses with a view to engineering preparation, it is quite possible for such students to grasp the subject, and highly desirable as well, especially in the third or fourth year. It is also well to observe that boys who have had a thorough course in plane and solid geometry have very little difficulty in descriptive geometry. In the Chicago high schools, technical course students are concerned in their sophomore year exclusively with developments and penetrations of solids. In these exercises are many problems involving the theorems of descriptive geometry. Why would it not be easy for these boys to cover a satisfactory course in descriptive drawing immediately following their sophomore year? Our universities and engineering schools, as a rule, are loath to accept the work of the secondary schools for entrance in this particular, and perhaps justly so, because of the varying success of our high schools in carrying on this work. Boys who leave from our best technical high schools for the universities and engineering schools very often are required to duplicate this work, much to their chagrin. It might be well for our higher institutions, through their examiners, to differentiate such institutions as are proficient and do offer a course in descriptive drawing, and credit this toward advancement in their college course. When this is done, there will certainly exist a happier relationship between our secondary schools and universities.

In the ensuing general discussion, Professor Van der Vries and Mr. Ermeling brought out the fact by a show of hands that in most of the institutions represented at the meeting the subject of descriptive geometry is taught not in the department of mathematics but in the department of drawing, and by technically trained instructors, although Mr. Willard and Professor Archibald were inclined to believe that a fuller investigation would show the contrary to be the case in the country at large. Professor E. W. Davis described the method as carried out at the University of Turin, where figures are sketched upon the blackboard in free-hand; he stressed the great help which descriptive geometry affords the students of solid geometry and on this ground urged this or the study of perspective as a part of the regular course in high-school geometry.

As an instance where the methods of descriptive geometry lend themselves readily to the satisfactory solution of a problem often treated unscientifically even by mathematically trained persons, Professor Roever described the method for drawing the representation of a line perpendicular to a given plane. A lively interchange of views between Professors Roever and Millar brought out the fact that the principles of representation (*e. g.*, in isometric projection, which was at the time under discussion) are not always applied consistently. In response to Professor Millar's doubt as to the ability of high-school pupils to handle descriptive geometry readily, Mr. Willard expressed his decided judgment based on his teaching experience that they do show a sufficient ability. Professors Dodd and Hadley pointed out that the course is sometimes given successfully, paying only secondary consideration to the extreme accuracy of the constructions. Following Professor Burgess's remark as to his unhappy memory of the course made up as it was of a long succession of puzzling drawings carrying out meaningless rules, Professor Wilczynski summed up the discussion by saying that it is altogether evident that there has been too much purely mechanical following of particular methods without a proper presentation of the mathematical principles involved, and that the leading colleges and universities must do their share in bettering this instruction and making more certain the undoubted benefits which come from the study of descriptive geometry.

REPORTS OF STANDING COMMITTEES.

(1) National Committee on Mathematical Requirements.

(*a*) "Scientific Investigations of the Committee." PROFESSOR A. R. CRATHORNE, University of Illinois.

(*b*) "The Work of a Committee representing the Central Association of Science and Mathematics Teachers." MR. J. A. FOBERG, Crane Junior College, Chicago, Chairman Coöperating Committee.

(2) Committee on Libraries.

(A report of this committee was published in the October MONTHLY in the form of a list of 160 mathematical books for schools and colleges.)

Discussion opened by PROFESSOR H. E. SLAUGHT, University of Chicago.

(3) Committee on Mathematical Dictionary. Preliminary Report by the Chairman, PROFESSOR E. R. HEDRICK, University of Missouri.

(4) Committee on Annals of Mathematics. Report by the Chairman, PROFESSOR E. H. MOORE, University of Chicago.

(5) Committee on Bureau of Information. Report by the Chairman, PROFESSOR J. B. SHAW, University of Illinois.

(1*a*) The subcommittee on scientific investigations is at present studying the application of the theory of correlation to educational data. Several thousand complete records of high-school pupils in different parts of the country are being collected to form a statistical basis for the investigation. The correlation coefficients not only for mathematics and other subjects, but, for comparison purposes, the coefficients for many other pairs of subjects will be discussed. The question to be answered is this: "If subject A is considered by educators to be a fundamental part of all secondary curricula, does proficiency in mathematics count more or less than proficiency, say, in stenography, or civics, towards an increase of proficiency in A?"

There is a fairly well-defined theory believed in by most psychologists to the effect that training gained in the study of one subject is of use in the study of some other subjects. The technical word "transfer" is used in this connection. The real question at issue in connection with formal discipline is the amount and method of transfer. A commonly accepted statement of this principle of formal discipline (Bagley's) is as follows:

> "The present interpretation of the doctrine of formal discipline is based upon the belief that specific habits may be generalized into ideals and prejudices, which in turn make possible the acquisition of similar habits in new fields, as when from the specific habits of accuracy and close reasoning developed in the school exercises in mathematics one comes gradually to idealize accuracy and close thinking as methods of procedure that will bring desirable results in other fields."

One of the first steps in answering the question "Should mathematics be required of all high-school pupils," would be then to investigate the "spread," "transfer" or "generalizing power" of mathematics. We all believe that a boy or a girl who has taken a thorough course in algebra will do some things better than one who has not taken such a course. What these things are and how much better the first pupil will do them are things to be found out. The number which represents the "how much better" we might call the "factor of transfer" or "coefficient of spread." The object of this subcommittee is to find out as far as possible the connection between this "factor of transfer" and the correlation coefficient. The object is not primarily to find arguments in defense of mathematics, but an open-minded investigation of correlation theory applied to educational measurements, with enough data behind it to make the results conclusive.

The Council of the Mathematical Association has voted the sum of one hundred dollars to take care of the great amount of purely clerical work involved in gathering the records used in this investigation.

(1*b*) At the Chicago meeting of 1916 the Mathematics Section of the Central Association of Science and Mathematics Teachers ordered the appointment of a committee to coöperate with the National Committee on Mathematical Requirements. Professor W. W. Hart, of the University of Wisconsin, then chairman of the Section, appointed a committee of twelve, distributed over the territory covered by the Association, and during the year past this committee has acted in cooperation with the National Committee.

At the request of Professor J. W. Young, a report was prepared by a subcommittee, with Mr. Alfred Davis of the Francis W. Parker School as chairman, on the topic "Valid Aims of Mathematics Teaching in the Secondary School." This was one of several preliminary reports submitted to Professor Young, who is soon to publish a final report on this topic. This subcommittee report[1] will appear in *School Science and Mathematics,* beginning in January, 1918.

A questionnaire addressed to prominent business folk and professional people of Chicago was prepared by another subcommittee, with the idea of investigating the opinions held by such persons concerning the value of mathematics teaching in the high school. This questionnaire was published at length in *School and Society* of November 17, 1917; discussion and comment concerning it has appeared in subsequent numbers.

Another subcommittee prepared a Report on First-Year Mathematics for the high school—a topic to be worked over more in detail in coöperation with the representative of the Association of Teachers of Mathematics in New England during the coming year.

After submitting its report at the Columbus meeting of the Central Association, the Coöperating Committee was continued for a year, with instructions to carry on the work in cooperation with the National Committee.

In the discussion which followed these two reports, Professor Hedrick, as the one who had been responsible in 1916 for the appointment of the National Committee, stated that it was distinctly understood that this Committee on Mathematical Requirements was to enlist the coöperation of committees of secondary-school teachers all over the country, and that these would be thus grouped together in effective service through this agency of the National Association. The whole discussion and recent correspondence makes manifest the growing consciousness over the country that here is for the first time in the history of American mathematics a powerful organized body which is investigating the whole question of mathematics as a school subject, employing in this study the definite information and the scientific training of the mathematicians of the whole country and at the same time putting aside natural prejudices in favor of mathematics as fully and honestly as is humanly possible.

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[1] Reprints of this report and the questionnaire may be had from Mr. Alfred Davis, Parker School, 330 Webster Ave., Chicago, at ten cents per copy.

(2) Professor Slaught, in speaking of the work of the Library Committee, first endeavored to show its proper setting in the general scheme of activities of the Association. Keeping in mind the general purpose of the Association, namely, to advance the interests of mathematics in the collegiate field, he mentioned three great streams of influence: (1) Meetings—national, sectional, and local; (2) Committees—on mathematical requirements, on libraries, and on bureau of information; (3) Publications—the MONTHLY, the *Annals*, and the proposed Dictionary. The national meetings, at best, can bring together only a small fraction of the members; but we may hope to see the sections become so numerous that every member may attend at least one meeting a year; and there is wide range and great opportunity for local clubs in the larger cities and in normal schools and colleges. The standing committees of the Association constitute the laboratories from which, as time goes on, will emanate the deliberative pronouncements of this national body on the great questions of every character which concern the vital interests of undergraduate mathematics in America. Already, our various committees are doing foundation work, especially in the three lines mentioned above. The publications of the Association are the channels through which must flow all these streams of influence to the individuals and institutions in the membership of the Association, and by means of which the interchange of ideas necessary to progress and growth is made. The MONTHLY, in this respect, stands in the most intimate relation to every member; the *Annals*, in its relationship to the Association, supplies a need that has long been felt in this country; and the proposed Dictionary opens up a great field of possible service to the college teachers and students of mathematics.

The Library Committee consisting of Florian Cajori, E. S. Crawley, Solomon Lefschetz, W. R. Longley, R. E. Root, and W. B. Ford, Chairman, was appointed in reponse to a pressing need based upon requests from many sources for assistance both in selecting mathematical books for a small college library and in convincing local authorities of the need of such books. The committee wisely limited this list to what would seem to be an irreducible minimum, and also classified the books according to the needs of students at the various stages of progress in the collegiate course.[1] The members of the committee have expended much time and energy in selecting these titles. They make no claim of infallible wisdom, in including this particular book or excluding that one, but it is clear that, in general, they have shown excellent judgment, and that they certainly have made a most worthy first approximation. Any college library which contains this list of books will provide suitable opportunity for its mathematical students who wish to know something more of the various subjects than can be found in the text-books used in the class-room. The committee will welcome suggestions of any sort with respect to this list. At the business meeting in the afternoon, the committee was requested by formal vote to prepare a list of text-books available for the various collegiate subjects, giving the publishers, the cost, and brief comments as to the character and scope of each. Presumably, the committee will include in this list all of the subjects mentioned in the tentative report of the Dictionary Committee immediately following this report. Such a list of text-books will be of the greatest service to collegiate teachers everywhere.

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[1] The report was published in full in this MONTHLY for October, 1917, pp. 368–376. Reprints may be had from the Secretary, Professor W. D. Cairns, 27 King Street, Oberlin, O., upon request accompanied with a three-cent stamp.

(3) Your Committee on Mathematical Dictionary, consisting of R. C. Archibald, H. L. Rietz, H. E. Slaught, D. E. Smith, and E. R. Hedrick, chairman, appointed at the Cleveland meeting, begs to report as follows:

After considerable correspondence and discussion at the Chicago meeting, the committee is agreed tentatively upon several important points, but none of these is irrevocably settled, and it is hoped that discussion here and suggestions by individuals later, either orally or preferably in writing, will assist the committee in revising and completing these tentative conclusions.

It is thought wise not to attempt any publication during the period of the war, but since the time required for the preparation of any such work would be very great, it is felt that we need not hesitate to initiate the work as soon as is practicable.

After some rough computation, we believe that a dictionary containing brief definitions of the words employed up to and including the end of collegiate work proper, or possibly including the first graduate year, could be condensed into two reasonable volumes which might be sold at approximately five dollars each. It is desirable that the committee have opinions as to the salableness of a work of this character and price, and as to its usefulness as thus limited in scope, and members are asked to advise the committee in writing.

As to the scope of the work, it is thought impracticable to include all mathematical terms used in the entire literature. Some line of demarkation seems inevitable. The committee has tentatively placed this line at the conclusion of the collegiate curriculum; that is, to include all words used in mathematical courses usually offered to undergraduates, or in some institutions to first-year graduates, and words that might occur in their assigned reading. This would cover the texts and references used in at least the following subjects: elementary algebra and geometry, trigonometry, plane and solid analytic geometry, and a first and second course in the calculus, together with elementary first courses in differential equations, higher analytic geometry (including curves and surfaces), higher algebra (including theory of equations, determinants, etc.), the theory of numbers, the theory of functions of real and of complex variables, the theory of groups, descriptive geometry, projective geometry, line geometry, differential geometry, mechanics, and the theory of probability and statistics.

It is assumed that no lengthy articles would be included, but only brief definitions, accompanied by necessary references to more complete sources, the ordinary linguistic comments, and possibly the equivalent words in French, German, and Italian.

A question exists regarding the inclusion of historical matter, since this is already reasonably covered by existing encyclopædias and by histories of mathematics. In certain cases, as in the entry "Taylor's Theorem," brief historical data might be given.

It was upon the basis of such a plan that the above estimate of size and price was made. Any enlargement of scope would entail obvious increase in size, time required for preparation, and price, and consequent decrease in probability of success in selling the dictionary widely to those who most need it.

It is felt that the venture is worth while only if it can be completed in a thoroughly scholarly manner, and so as to reflect credit upon the Association and upon American mathematics as a whole. To this end the interest and coöperation of some of our foremost scholars would be an essential, and we should hesitate to enter upon the work without the most certain assurance of such coöperation and support.

After hearing discussion here, and receiving suggestions from members personally, as a result both of this meeting and of the publication of this tentative report, the committee will try to formulate a more detailed and final report to be presented at some meeting of the Association during the ensuing year.

The above report was discussed briefly at the close of the business meeting in the afternoon. Two points were brought out clearly and evidently endorsed by the sentiment of those present: (1) That such a dictionary is greatly needed by those who are not within reach of large mathematical libraries, as is the case with most teachers and students of mathematics in the colleges of the country. This need was emphasized in most convincing manner by Professor A. F. Frumveller of Marquette University, Milwaukee, Wisconsin; (2) that such a dictionary is not greatly needed by the professors and research students of the graduate schools, and that the only justification for the Association's proposed sponsoring of such a venture is the real service which it may render in the collegiate field where at present no reference books comparable in scope and potential usefulness are available. This point of view was emphasized by Professor Slaught, who declared that his interest in the dictionary project was based entirely upon its adaptation to the needs of college teachers and students.

(4) A report of the Committee on the relations of the Association with the *Annals of Mathematics* was made by the chairman, Professor E. H. Moore, at the dinner on Thursday evening. Attention was called to the fact that the articles of expository or historical character for which the Association is supplying a subvention are now appearing in the *Annals* and that the next one will be by Professor D. R. Curtiss in the March issue on "A Chapter in the Theory of Equations." An appeal was made for contributions of articles of the character

in question, the present scarcity being attributed to the fact that this opportunity for the publication of such articles has so recently become effective. The committee will welcome any information concerning possible articles, especially those in which the exposition is made in the simplest and most direct form regardless of the space required in order to achieve this end.

(5) The Bureau of Information desires to report that it has served its purpose to some extent during the past year. It has replied to thirteen inquiries, furnishing information as to text books, history of mathematics, pedagogy of mathematics, a few problems of special interest to the proposer, and has thrown light on certain questions that puzzled the inquirers.

The chairman of the bureau, Professor J. B. Shaw of the University of Illinois, would offer the suggestion that the bureau be rather steadily advertised, as it probably has not yet come to the attention of many persons that such a bureau exists and is doing business. If the number of inquiries was greater the bureau would be able to maintain at least a page of replies in each number of the MONTHLY and it would be then advertised as a matter of course.

MEETINGS OF THE COUNCIL OF THE ASSOCIATION.

The Council held meetings on Thursday afternoon and on Friday and Saturday, ten members being present at each session.

(1) The following twenty-four persons and three institutions, on applications duly certified, were elected to membership:

To individual membership:

C. C. BRAMBLE, instructor in mathematics, U. S. Naval Academy, Annapolis, Md.
A. L. CANDY, professor of pure mathematics, University of Nebraska, Lincoln, Neb.
R. C. COLWELL, professor of mathematics, Geneva College, Beaver Falls, Pa.
C. G. CROOKS, professor of mathematics, Centre College, Danville, Ky.
P. J. DANIELL, assistant professor of applied mathematics, Rice Institute, Houston, Tex.
ALEXANDER DILLINGHAM, instructor in mathematics, U. S. Naval Academy, Annapolis, Md.
C. S. DOAN, head of mathematics department, Friends' Select School, Philadelphia, Pa.
THEODORE DOLL, fellow in mathematics, Northwestern University, Evanston, Ill.
H. H. DOWNING, assistant professor of mathematics, University of Kentucky, Lexington, Ky.
E. T. FRANKEL, statistician, Police Department, New York, N. Y.
L. M. GRAD, New York, N. Y.
W. H. HAYS, teacher, Broadway High School, Seattle, Wash.
L. S. JOHNSTON, professor of mathematics, State Normal School, La Crosse, Wis.
J. E. MCATEE, instructor in mathematics, University of Illinois, Urbana, Ill.

V. S. Mallory, vice-principal and instructor in mathematics, High School, Dumont, N. J.
I. L. Miller, professor of mathematics, Carthage College, Carthage, Ill.
M. J. Newell, Township High School, Evanston, Ill.
Jessie G. Quigley, professor of mathematics, College of Saint Teresa, Winona, Minn.
J. A. Sallade, instructor in mathematics, Pennsylvania State College, State College, Pa.
Marion E. Stork, professor of mathematics and astronomy, Meredith College, Raleigh, N. C.
Marian M. Torrey, teacher of mathematics, St. Johnsbury (Vt.) Academy.
Warren Weaver, assistant professor of mathematics, Throop College of Technology, Pasadena, Calif.
W. H. Wilson, instructor in mathematics, Massachusetts Institute of Technology, Cambridge, Mass.
S. D. Zeldin, instructor in mathematics, College of Hawaii, Honolulu, Hawaii.

To institutional membership:

Illinois Wesleyan University, Bloomington, Ill.
College of Saint Teresa, Winona, Minn.
Millsaps College, Jackson, Miss.

(2) Since the enlistment of a number of our members in military service may make it impossible for them to continue as active members, the Council voted as follows:

> On request, the name of any member of the Association who is in the army or navy, or is in other war service over-seas, will be retained on the roll of membership without the payment of dues. The Monthly will be forwarded, however, only if a definite mailing address is furnished by the member.

(3) It was voted to hold the next annual meeting in New York City in connection with the meeting of the American Mathematical Society. The mathematics faculty of Columbia University has kindly indicated its hearty approval of this plan.

(4) The Council approved the plan already announced in the December Monthly for a shortened register of members, containing the full list of members, including the names, academic record and addresses of those elected since the publication of the charter membership, and any corrections in names, titles or addresses that are reported to the secretary-treasurer promptly.

(5) Matters of regular business routine were referred with power to the Council's Committee on Finance, a standing committee which, in conformity with the amended constitution, is now composed of the President, Secretary-Treasurer and Manager.

(6) The Council voted to direct its future Nominating Committees, in choosing the second candidate for each office, to take into account not only the votes for each person for that particular office, but also the total vote for that person

for all the offices. (See "Comments on the Preliminary Ballot," page 67 of this issue.)

(7) Professor MARY EMILY SINCLAIR of Oberlin College was appointed Librarian of the Association.

(8) In accordance with the amendments adopted at the annual business meeting, the Council made the following appointments:

Secretary-Treasurer: W. D. CAIRNS.
Committee on Publications:
W. H. BUSSEY, Review Editor.
H. E. SLAUGHT, Manager.
R. D. CARMICHAEL, Editor-in-Chief.
Associate Editors:

R. C. ARCHIBALD,
E. L. DODD,
OTTO DUNKEL,
B. F. FINKEL,
TOMLINSON FORT,
H. R. KINGSTON,
HELEN A. MERRILL,
U. G. MITCHELL,
R. E. MORITZ,
D. A. ROTHROCK,
D. E. SMITH,
E. B. STOUFFER.

ANNUAL BUSINESS MEETING.

The secretary-treasurer announced the names of those just elected by the Council to membership. He also reported the death of the following ten members not previously reported, all charter members of the Association:

J. A. Colson, Searsport, Me.
Mrs. Elizabeth B. Davis, Nautical Almanac Office, Washington, D. C.
G. W. Hartwell, professor of mathematics, Hamline University.
C. S. Jackson, mathematical master, Royal Military Academy, Woolwich, Eng.
C. T. Levy, formerly teaching fellow, University of California.
J. W. Nicholson, professor of mathematics, Louisiana State University.
S. F. Norris, professor of mathematics, Baltimore City College.
E. W. Ponzer, assistant professor of mathematics, Stanford University.
L. E. Pratt, Tecumseh, Neb.
W. C. Wright, consulting actuary and accountant, Medford, Mass.

It was voted that the Committee on Libraries be continued and be asked to publish a list of current texts in collegiate mathematics, giving briefly the scope and character of each.

The amendments recommended by the Council (see November MONTHLY, pp. 445, 446) were adopted unanimously. It will be remembered that the main purpose of these was to divide the burdens of editorial work and to change the manner of choosing the secretary-treasurer so that this officer shall be selected by the Council rather than elected by vote of the Association.

The election of officers for the year 1918 was conducted both by mail and in person at this meeting, as provided by the constitution. The tellers (E. L. Dodd, O. J. Ramler, and H. B. Phillips, chairman) appointed by President Cajori reported the result of the balloting as follows, a total of 319 ballots having been cast, some of which were blank in whole or in part:

For President: E. V. Huntington, 215 votes; Oswald Veblen, 97 votes; scattering, seven votes.
For Vice-President: J. W. Young, 183 votes; D. N. Lehmer, 165 votes; R. C. Archibald, 154 votes; M. B. Porter, 101 votes.
For Secretary-Treasurer, W. D. Cairns, 294 votes.
For additional members of the Council to serve until January, 1921: Florian Cajori, 253 votes; G. A. Miller, 196 votes; E. J. Wilczynski, 194 votes; Elizabeth B. Cowley, 163 votes; H. E. Hawkes, 155 votes; W. H. Bussey, 130 votes; L. W. Dowling, 85 votes; A. M. Kenyon, 81 votes.

The following were accordingly declared elected:

President, E. V. Huntington, Harvard University.
Vice-Presidents, D. N. Lehmer, University of California, and
J. W. Young, Dartmouth College.
Secretary-Treasurer, W. D. Cairns, Oberlin College.

Additional members of the Council to serve until January, 1921:

Florian Cajori, Colorado College,
Elizabeth B. Cowley, Vassar College,
G. A. Miller, University of Illinois,
E. J. Wilczynski, University of Chicago.

The secretary-treasurer made his financial report for the year, giving an account of all business transacted for the Association up to December 1, 1917. The report of the auditing committee (Mary E. Sinclair, H. E. Slaught, and H. J. Ettlinger, chairman) was then made, and both reports were accepted and approved. The financial report is printed in full below.

Report of the Secretary-Treasurer as Treasurer, Dec. 1, 1917.

Receipts.

Balance Dec. 21, 1916		$2,953.24
1915 subscriptions	$ 2.00	
1916 subscriptions	22.25	
1916 indiv. dues	22.50	
1916 instit. dues	5.40	
1917 subscriptions	399.75	
1917 indiv. dues	2,080.98	
1917 instit. dues	263.00	
1917 init. fees	140.00	
Sale copies of Monthly	35.18	
Sale reprints	14.43	
Advertising	478.92	

Expenditures.

Publisher's bills		$1,942.37
Charter membership list		391.47
Managing editor's office		250.87
Other editors' postage		7.00
Committee on Membership		4.85
Comm. on Math. Requirements		23.19
Secretary-Treasurer's office:		
Postage	$137.72	
Bond	5.00	
Office supplies	25.36	
Express, telegrams, freight, etc.	18.93	
Library expenses	33.33	

Exchange	.42	
Interest State Savgs. Bk.	77.13	
Interest Peoples Bk.	30.04	
Total 1917 receipts		3,572.00
Total receipts up to 1918 business		$6,525.24
Total expenditures		3,392.58
Balance on 1917 business		$3,132.66
Rec'd on 1918–1920 business		352.81
Balance Dec. 1, 1917		$3,485.47

Clerical work	187.25	
Printing	101.04	
New York meeting	89.10	
Cleveland meeting	21.10	
Initiation fees paid to sections	4.00	
		622.83
ANNALS subvention		150.00
Total expenditures		$3,392.58
Cash on hand, not deposited		24.00
Checking account		380.91
State Savgs. Bk. Co. account		2,337.16
Peoples Bkg. Co. account		643.40
Liberty Bond		100.00
Bank balance Dec. 1, 1917		$3,485.47

Approved by the auditing committee,
H. J. ETTLINGER, *Chairman*,
MARY EMILY SINCLAIR,
December 28, 1917. H. E. SLAUGHT.

When the accounts were closed on December 1, 1917, as was necessary in order to furnish the auditing committee a complete record, there remained on the total business for the calendar year 1917 the following items:

BILLS RECEIVABLE.	
Advertising	$169.00
1917 dues unpaid	75.00
Back subscriptions	6.00
	$250.00

BILLS PAYABLE (either paid in December or estimated).	
Publisher's bills, June–Dec.	$1,560.00
Dec. ANNALS subvention	75.00
Init. fees due to sections	58.00
President's office	5.00
Editors' postage	20.00
Managing editor's office	50.00
Secretary-treasurer's office	125.00
Printing Chicago program, ballots, and application blanks	50.00
Committee on Membership	5.00
Comm. on Math. Requirements	100.00
Additional postage	45.00
Total, approximate	$2,100.00

If to the balance on 1917 business shown in this report, $3,132.66, there be added the amount of bills receivable, $250.00, and there be subtracted the estimated amount of bills payable, $2,100.00, there results an estimated final balance on 1917 business of approximately $1,280, as compared with a similarly estimated final balance a year ago of approximately $1,180. The major portion of this $1,280 is the thousand dollars which was turned over to the Association by the management of the MONTHLY when the Association was organized and which we feel must be kept intact as a reserve fund. The management is thus able to present a gain in the year's finances of about one hundred dollars, this gain having been brought about through the increased amount of advertising secured for the MONTHLY, through the continued expenditure of much time by a goodly number of officers at no expense to the Association, and in spite of various unavoidable expenditures, particularly the cost of paper in connection with the publication of the MONTHLY, this increase amounting to about $400.

The financial management feels that this is an auspicious showing, when it is considered that we have provided for the most pressing need of the National Committee on Mathematical Requirements and have put into operation the plan of subvention of the *Annals of Mathematics* as approved by the Association, an arrangement which it is certain will redound to the mutual advantage of the *Annals* and the members of the Association. The Association seems secure on the financial side, but if we are to continue to make a positive and strong contribution to the cause of mathematics in America, the Association will need the full support of its membership and the Council will not be free from the necessity of scanning with care all expenditures from the treasury.

Five hundred dollars of the reserve fund is being invested in a Liberty Bond, the final payment being made early in January.

W. D. CAIRNS, *Secretary-Treasurer.*

COMMENTS ON THE PRELIMINARY BALLOT.

By the SECRETARY.

The Constitution and By-Laws provide that "all members shall be given an opportunity to nominate by mail a candidate for each office for the ensuing year" and that for the final ballot "the Council shall announce two candidates for each office, one being the person who received the highest vote in the nominations and the other being selected by the Council from among the several nominees next in order." The spirit of the Constitution would thus seem to be that members, merely with the knowledge that a second candidate has been chosen in this manner, are expected to exercise their right of choice on the final ballot. The discretion here given to the Council enables its nominating committees to take cognizance of such considerations as uniform geographical distribution, a proper balance as between universities and colleges, large and small institutions, etc.

Three unfavorable symptoms have appeared in the working out of this system: (1) The number voting in the preliminary ballot is disappointingly small when compared with the membership of the Association. The full success of our democratic system is quite dependent on a large participation on the part of the membership. To the recurring expression of lack of knowledge of suitable candidates for nomination the obvious answer is the clear obligation resting upon each member of acquainting himself with his fellow members both within and outside his own particular region and of making representations at stated times of persons qualified for the manifold kinds of service in the Association. (2) It would seem that there is probably too concentrated a list of names voted for; the officers of the Association have continually tried, and have succeeded reasonably well in their endeavor, to enlist an ever increasing number of members in active service, in the conviction that there are many others well qualified to assume some of the responsibilities of the organization besides those who have as yet been chosen. Just how to accomplish this in the preliminary ballot without causing too great a scattering of votes and on the other hand without interfering with the members' free choice, is a puzzling question. A suggestion has been made that a list of names might be proposed for the various offices when the blanks for the preliminary ballot are sent to the members, this list to be large enough and representative enough so that the members would still have a real choice, yet might avoid the disadvantage mentioned under the next head, while there would also be the possibility of proposing other names than those on the suggested list. (3) The same names are often proposed for different offices, and the popular vote for a certain person is thus weaker than if concentrated upon one office. The Council has directed its nominating committees, in choosing the second candidate for each office, to take into account the total vote which each person has received for all the offices. This will materially aid in interpreting the wishes of the members; yet it would be a further improvement if this duplication of voting could be avoided.

It is to be understood that full secrecy is observed in all matters connected with the balloting. To make sure that the necessity of signing the ballots will not act as a deterrent in voting, the secretary will hereafter ask each member to return the *unsigned* ballot, putting his name on the outside of the envelope merely for the purpose of enabling the name of the member to be checked off from the membership list. Any suggestions as to improvements in the machinery of balloting will be gladly received by the secretary. The ends desired from the method adopted by the Association will be attained only if all members devote a stamp and a few moments' time, if no more, to each of the two ballots of the year.

THE SECOND ANNUAL MEETING OF THE MISSOURI SECTION.

The second annual meeting of the Missouri Section of the Mathematical Association of America was held in Kansas City on Saturday, November 17, 1917, in conjunction with the meeting of the Missouri State Teachers' Association. The session was held in the Public Library. The chairman of the Section, Professor L. D. Ames of the University of Missouri, presided.

Twenty-one visitors were present and the following fifteen members:

L. D. Ames, University of Missouri, Columbia.
Austin C. Andrews, Manual Training High School, Kansas City.
Otto Dunkel, Washington University, St. Louis.
Zoe Ferguson, Central High School and Junior College, St. Joseph.
R. R. Fleet, William Jewell College, Liberty.
B. F. Finkel, Drury College, Springfield.
Mary E. Helwig, High School, Kansas City, Kansas.